Two New Species of *Uvaria* (Annonaceae) from Borneo, with a New Nomenclatural Combination

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ABSTRACT. Two new species of *Uvaria* L. (Annonaceae), *U. beccarii* Attanayake, I. M. Turner & R. M. K. Saunders and *U. curvistipitata* Attanayake, I. M. Turner & R. M. K. Saunders, are described and illustrated from Borneo. *Uvaria beccarii* is closely allied to a Peninsular Malaysian species, *U. curtisii* King, from which it differs in having distinctively nonapiculate, obovoid monocarps with a blunt, irregularly muricate surface and fewer seeds per monocarp. *Uvaria curvistipitata* closely resembles *U. javana* Dunal from Peninsular Malaysia, Sumatra, Java, and Borneo, as both species have a velutinous indument on many organs. *Uvaria curvistipitata* differs, however, in its red flowers and smaller, fewer-seeded globose to subglobose monocarps that are borne on longer, curved stipes. A new nomenclatural combination, *U. clementis* (Merr.) Attanayake, I. M. Turner & R. M. K. Saunders, is furthermore validated, based on the previously overlooked name *Artabotrys clementis* Merr., providing a legitimate name in *Uvaria* for the species. The names *U. clementis* and *U. parviflora* Hook. f. & Thomson are lectotypified here.

Key words: Annonaceae, Borneo, IUCN Red List, *Uvaria*.

Uvaria L. is one of the largest paleotropical genera in the Annonaceae (Keßler, 1993), with ca. 210 species. The genus is widespread in wet tropical lowland forests in Africa, Madagascar, continental Asia, Malesia, and northern Australia, with a center of diversity in continental Southeast Asia and Malesia (Meade, 2005). All species of *Uvaria* are woody lianas or scrambling shrubs, climbing by means of twining branchlets. The genus is characterized by the presence of stellate hairs (throughout the plant), valvate sepals, partially or fully imbricate petals, numerous stamens and carpels, monad inaperturate pollen, and monocarps with one to many seeds, generally arranged in two lateral rows (Meade, 2005; Zhou et al., 2009). The circumscription of the genus has recently been extended to include species of *Anomianthus* Zoll., *Balonga* Le Thomas, *Cyathostemma* Griff., *Dasoclema* J. Sinclair, *Ellipeia* Hook. f. & Thomson, *Ellipeiopsis* R. E. Fr., *Rauwenhoffia* Scheff., and Australian species of *Melodorum* Lour., which have all been shown to be nested within *Uvaria* in phylogenies based on chloroplast DNA sequence data (Zhou et al., 2009, 2010). The diagnostic morphological features previously used to distinguish these genera have been shown to be merely specialized adaptations of the basic *Uvaria* structure.

Although several regional taxonomic revisions of *Uvaria* have been completed—most notably for Peninsular Malaysia (Sinclair, 1955) and continental Asia north of the Isthmus of Kra (Meade, 2000)—no comprehensive taxonomic treatment has been attempted so far. Ongoing studies of *Uvaria* in Borneo indicate that there are over 30 species in the region, including two new species that are described here. A new nomenclatural combination is also validated here, associated with the recent transfer of *Cyathostemma* species to *Uvaria* (Zhou et al., 2009).

1. Uvaria beccarii Attanayake, I. M. Turner & R. M. K. Saunders, sp. nov. TYPE: Malaysia. Sarawak: Mt. Matang, 1863–1865 [1865, fide van Steenis-

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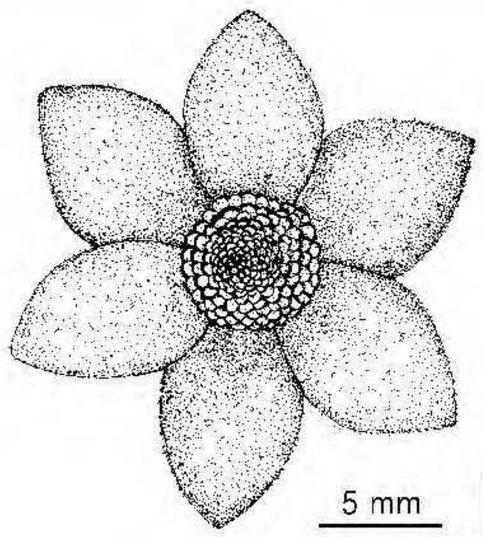

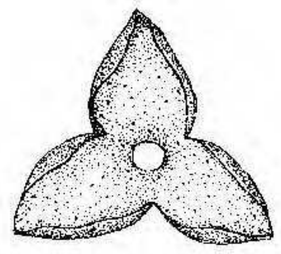

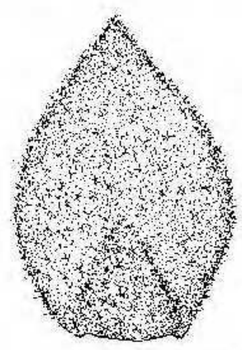

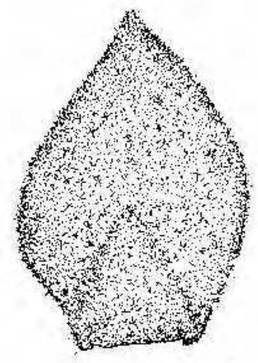

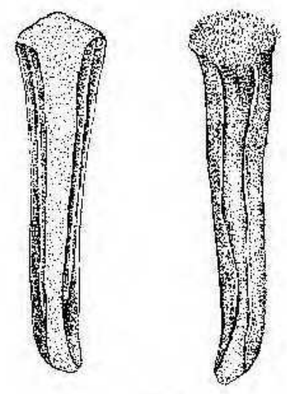

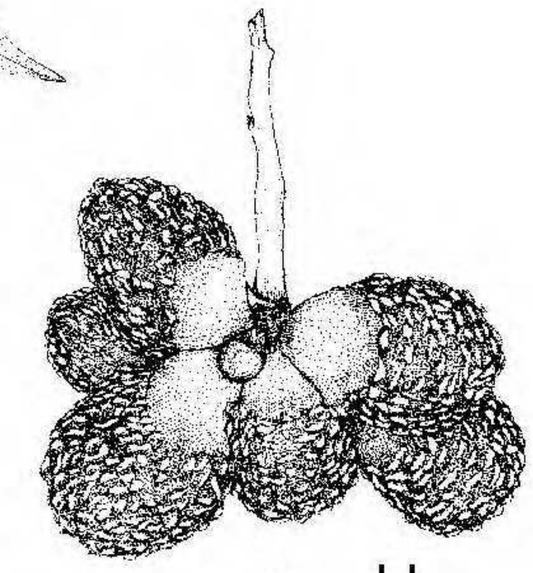

Figure 1. *Uvaria beccarii* Attanayake, I. M. Turner & R. M. K. Saunders. —A. Flowering branch. —B. Flower at anthesis. —C. Calyx with three basally connate sepals. —D. Outer petal (adaxial view). —E. Inner petal (abaxial view). —F. Stamens (adaxial view [left] and abaxial view [right]). —G. Carpel. —H. Fruit, with proximal monocarps removed. A drawn from *Abbe et al. 10267* (E); B–G from *Anderson S16410* (L, SAR, SING); H from *Lee & Paie S37958* (L).

Kruseman, 1950: 43], *O. Beccari P.B. 1648* (holotype, K; isotypes, BO, FI-B). Figure 1.

Species haec ab *Uvaria curtisii* King foliorum basibus cuneatis vel subcordatis, sepalis in fructu persistentibus, monocarpidiis sessilibus obovoideis (apicibus rotundatis) irregulariter muricatis, diaphragmatibus inter semina membranaceis atque seminibus in quoque monocarpidio paucis (4 ad 7) differt.

Large woody climbers, to 25 m high; twigs drying dark gray or gray-brown, bark minutely latticed longitudinally, younger parts densely covered with brown stellate hairs, ca. 0.5 mm. Leaves chartaceous, drying dark brown or gray-brown adaxially, dark brown to brown abaxially; laminas elliptic to narrowly obovate, 7–15 × 2.5–5.5 cm, glabrous adaxially, but densely hairy over midrib, sparsely hairy abaxially,

but densely hairy over veins, blade base subcordate to cuneate, apex acute to broadly acuminate, margin generally hairy, not thickened, not revolute; midrib slightly sunken adaxially in dry leaves, prominent abaxially; secondary veins 11 to 15 pairs per leaf, arching forward, looping obscurely well within margin, ± flush adaxially, prominent abaxially; tertiary venation reticulate, visible abaxially, obscure adaxially; petioles 2–7 × 1–1.9 mm, generally with transverse ringlike markings, densely hairy. Inflorescences supra-axillary to subopposite, 1- or 2-flowered; peduncles 1–2 mm, without bracts; flower pedicel 12–22 × 0.8–1.4 mm, densely hairy with brown hairs; basal bract narrow, leaflike, not clasping pedicel, 3–5.5 × 1–2 mm, sparsely hairy adaxially, densely hairy abaxially; median bract on the upper half of pedicel, narrow, leaflike, 2.5–3.5 × 1.5–2 mm, subglabrous adaxially, densely hairy abaxially. Calyx completely covering immature flower bud, splitting almost to base at maturity, persistent on fruit; sepals triangular, 6–11 × 6.5–9.5 mm, drying dark brown with granular black dots on both surfaces, sparsely hairy (denser toward base) abaxially; petals white, pale yellow, or greenish yellow, spreading at anthesis, inner and outer whorls subequal, slightly imbricate, ovate-elliptic, ca. 10 × 5 mm, densely hairy adaxially and abaxially, with short pale brown hairs, midrib visible, apex obtuse; stamens ca. 300 per flower; connective truncate, papillate; carpels ca. 35 to 40 per flower, ca. 2 mm; stigma split funnel-shaped; ovary angular, hairy; floral receptacle ovoid, apically flattened, ca. 3.5 mm diam. Fruiting peduncles 5–14 × 2–3.7 mm; fruiting pedicels 16–25 × 2.8–4 mm, drying striate, brown, sparsely hairy; fruiting receptacle densely hairy, ca. 10 mm diam. Monocarps greenish brown, 8 to 15 (or more) per fruit, obovoid, 2–3.5 × 1.5–2.5 cm, monocarp surface irregularly muricate, drying brown, densely hairy, with short golden hairs, apex rounded, base acute; pericarp thick, 1.7–3.8 mm; stipes absent; seeds 4 to 7 per monocarp, attached laterally in 2 rows, separated in monocarp by membranous diaphragms, ellipsoidal with 1 or 2 flattened faces, ca. 12 × 6–8 × 3–6 mm, drying brown, smooth, shiny; aril, raphe, and hilum unclear.

Distribution and habitat. *Uvaria beccarii* is endemic to Borneo (Brunei, Sabah, and Sarawak; Fig. 2). It is known from lowland dipterocarp forests (primary and disturbed), near streams and freshwater swamps, at elevations from 30 to 720 m.

IUCN Red List category. *Uvaria beccarii* is assessed as Near Threatened (NT) according to IUCN Red List categories and criteria (IUCN, 2001). Although the new species is represented by only nine herbarium collections from seven disparate localities, the species does not meet the criteria for the Vulnerable (VU) category as the extent of occurrence exceeds 20,000 km². The collections are generally old, with only three collections since the 1970s. Although five of the collections are from comparatively well-protected areas (Semengoh Arboretum, Sarawak; Belait, Brunei; and Bongaya and Kelumpang Forest Reserves, Sabah), one is from an area subject to severe logging (Batu Laga, Ulu Belaga, Sarawak). The localities of collections are geographically distant (Fig. 2), suggesting possible fragmentation. The Near Threatened (NT) category is recommended as forest depletion is prevalent due to extensive logging, agricultural practices, and urbanization (Barraclough & Ghimire, 2000).

Phenology. Flowering specimens were collected between April and June; only two fruiting specimens are known, collected in September and October.

Etymology. The specific epithet honors Odoardo Beccari (1843–1920), who extensively collected Bornean plants, including the type collection of this species. Beccari appears to have recognized that the specimen represented a new species and distributed the material under the ined. name *Uvaria vallombrosana*, the proposed epithet deriving from the name of the house, "Vallombrosa," he had built on Mt. Matang in Sarawak.

Discussion. *Uvaria beccarii* is closely associated with a group of species that includes *U. calamistrata* Hance, *U. curtisii* King, *U. hirsuta* Jack, and *U. grandiflora* Roxb. ex Hornem. These species possess leaflike bracts that do not clasp the pedicel, a calyx that entirely covers the immature flower bud and that later splits into a variable number of segments at anthesis, stamens with a truncate connective, and densely tomentose monocarps. Among these species, *U. beccarii* is most similar to *U. curtisii* (King, 1893; Sinclair, 1955; Attanayake, pers. obs.), as they both have few-flowered inflorescences with white or pale yellow flowers, and sepals with inconspicuous venation and black glandular cells. *Uvaria curtisii* can be distinguished from *U. beccarii*, however, by its leaves that have an acute to obtuse base and by the monocarps that are cylindrical, apiculate, have a smooth surface, and have more seeds per monocarp (12 to 14).

The fruits of *Uvaria beccarii* are morphologically similar to those of the Bornean species *U. verrucosa* Scheff. (Scheffer, 1885), although the two species are unlikely to be confused if flowering material is available. *Uvaria verrucosa* fruits are borne on shorter

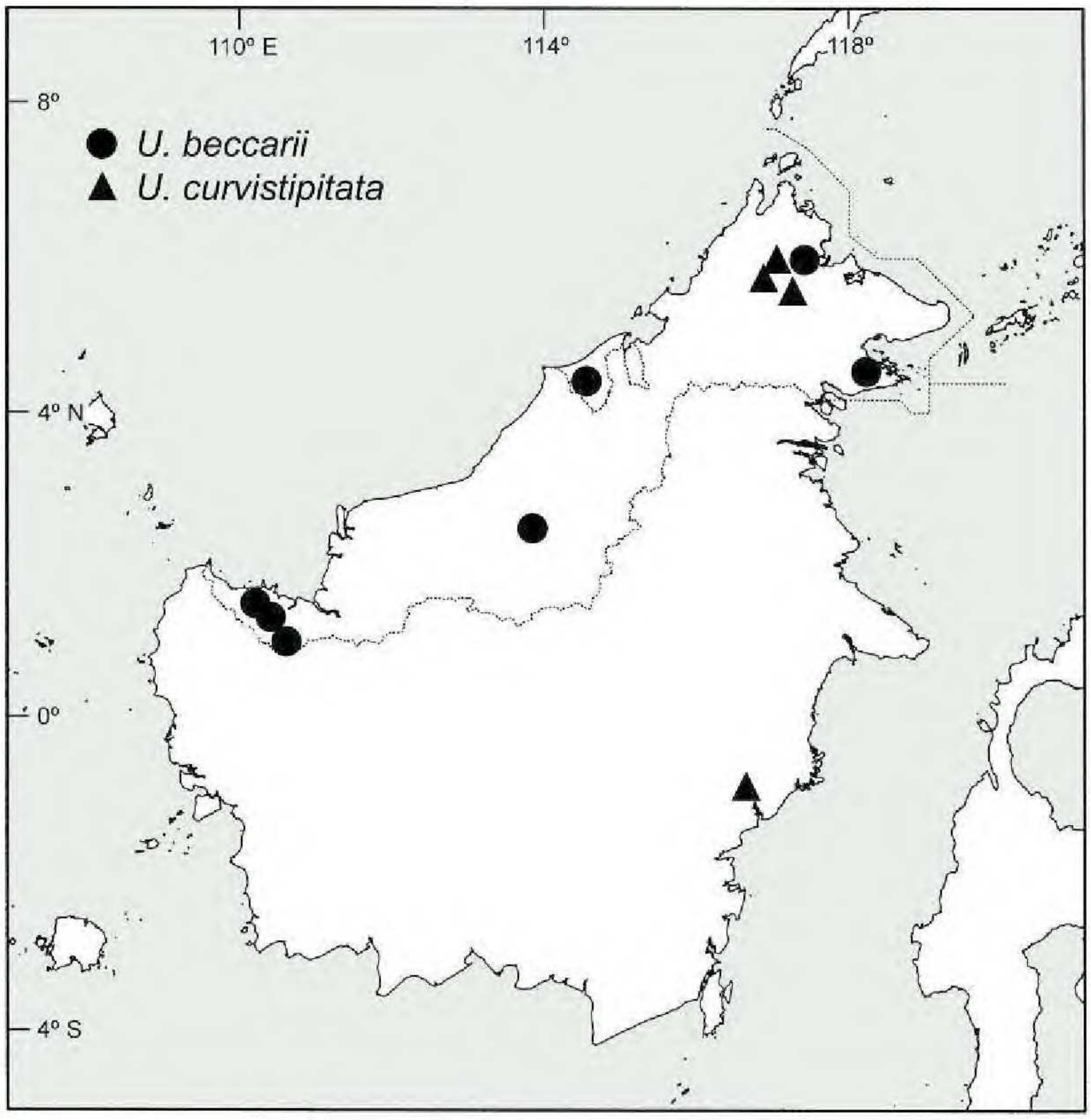

Figure 2. Distribution of known collections of *Uvaria beccarii* and *U. curvistipitata* in Borneo.

peduncles and pedicels (ca. 1.5 mm and 6–7 mm, respectively), have a smaller receptacle (3.5–5.5 mm diam.), and the monocarps are smaller (ca. 9–16 × 10–12 mm), subglobose with an apiculate apex, and have fewer seeds (one to three).

Paratypes. BRUNEI. **Belait:** on Belait River upstream from Malayan River, Belait, 23 Oct. 1988, *Wong Khoon Meng WKM 570* (K). MALAYSIA. **Sabah:** Beluran Distr., Bongaya Forest Reserve, 17 July 1975, *Aban & Kodoh SAN 81977* (K); Mostyn Distr., Kelumpang Forest Reserve mi. 17, 13 Apr. 1966, *H. T. Sinanggul SAN 54532* (SAN). **Sarawak:** Kuching Div., 53 mi. from Kuching, Sungai Engkabang, 1°2′N, 110°40′E, 12 May 1962, *L. B. Abbe, E. C. Abbe, J. A. R. Anderson, Haji Suib, Mansor, Banying & Sibat 10267* (E, K); Kuching Div., Serian, 53rd mi. Simanggang Rd., Sungai Engkabang, 12 May 1962, *J. A. R. Anderson S16410* (K, L, SAR, SING); Kuching Div., Semengoh Forest Research Arboretum, 18 Oct. 1962, *Rosli S14780* (K, KEP, L); Kuching Div., Semengoh Arboretum, 9 Sep. 1976, *B. Lee & I. Paie S37958* (K, L, SING); N of Dataran, Batu Laga, Ulu Belaga, 24 June 1995, *S. T. Lai, Rantai et al. S72451* (L).

2. Uvaria curvistipitata Attanayake, I. M. Turner & R. M. K. Saunders, sp. nov. TYPE: Malaysia. Sabah: Labuk & Sugut, W side of Bukit Doji pass from Telupid to Ulu Karamuak, 25 Oct. 1968, *S. Kokawa & M. Hotta 435* (holotype, SAN; isotypes, KYO, L). Figure 3.

Species haec ab *Uvaria javana* Dunal pedicellis brevioribus (6–8 mm), petalis ovatis rubris, monocarpidiis globosis ad subglobosis (axibus rectis) laevibus vel inconpicue undulatis stipitibus longioribus (ca. 39 mm) curvis insidentibus atque seminibus paucis (2 ad 6) differt.

Large woody climbers, maximum height unknown; twigs drying dark brown or black, bark minutely striate longitudinally, younger parts densely covered with brown stellate hairs ca. 1 mm. Leaves chartaceous to coriaceous, drying brown or gray-brown adaxially, brown abaxially; laminas typically obovate, 12–25 × 6.5–13 cm, variably hairy adaxially, sometimes only over veins, densely hairy abaxially, base subcordate to cordate, apex obtuse to shortly acuminate, margin densely hairy, slightly thickened, slightly revolute; midrib flush or slightly sunken adaxially in dry leaves, prominent abaxially; secondary veins 13 to 19 pairs per leaf, arching forward, looping obscurely well within margin, ± flush adaxially, prominent abaxially; tertiary venation reticulate, visible abaxially, obscure adaxially; petioles 5–15 × 1.7–5 mm, smooth, densely hairy.

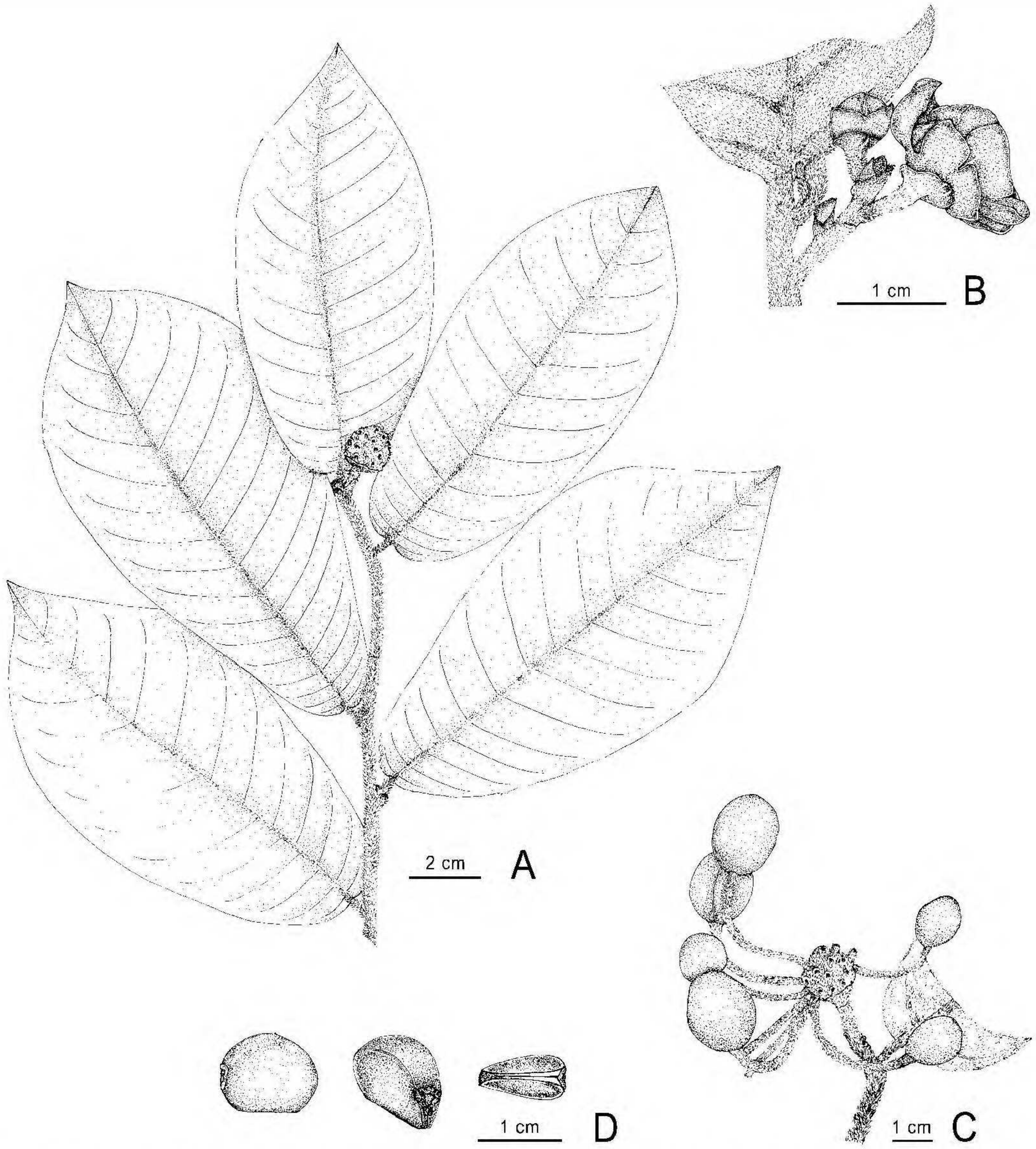

Figure 3. *Uvaria curvistipitata* Attanayake, I. M. Turner & R. M. K. Saunders. —A. Fruiting branch. —B. Inflorescence. —C. Fruiting branch. —D. Seeds (three views). A, C, D drawn from *Sigin et al. SAN 56772* (K, KEP); B from the holotype *Kokawa & Hotta 435* (SAN).

Inflorescences supra-axillary, 2- to 4-flowered; peduncles 3.5–4 mm, without bracts. Flower pedicel 6–8 × 2.1–2.3 mm, densely hairy with brown hairs; basal bract broadly ovate, clasping pedicel, size unknown, densely hairy adaxially and abaxially; median bract on the upper half on pedicel, broadly ovate, 3–5.5 × 7–8 mm, densely hairy adaxially and abaxially; calyx exposing apex of immature flower bud, splitting halfway to base at maturity; sepals broadly ovate, ca. 5 × 7 mm, drying brown, smooth on both surfaces, densely hairy abaxially; petals red, partially open at anthesis, inner and outer whorls subequal, slightly imbricate, ovate, ca. 8 × 8 mm, densely hairy adaxially and abaxially, with short pale brown hairs, midrib visible, apex obtuse; stamens and carpels not seen. Fruiting peduncles 3–9 × 3.2–3.7 mm; fruiting pedicels 8–16 × 3.8–4.5 mm, drying minutely striate, brown, densely hairy; fruiting receptacle densely to scattered hairy, 13–16 mm diam. Monocarps greenish, 27 to 36 per fruit, globose to subglobose, 1.5–2 × ca. 1.5 cm, surface ± smooth to inconspicuously undulate, sometimes with longi-

Table 1. Summary of morphological differences between *Uvaria curvistipitata*, *U. javana*, and *U. excelsa* (Attanayake, pers. obs.).

	U. curvistipitata	*U. javana*	*U. excelsa*
Vegetative indument length	medium to long hairs	short to medium hairs	short to medium hairs
Petiole rings	absent	present or absent	present
Inflorescence size	2 to 4 flowers, comparatively separated on rachis	1 to 3 flowers, comparatively separated on rachis	2 to 20 flowers, crowded on rachis
Pedicel length	6–8 mm	10–27 mm	2–5 mm
Sepal fusion	basally connate	basally connate	free
Petal color	red	yellow	yellow to rusty red
Outer petal shape	ovate	elliptic	broadly ovate
Fruit peduncle length	3–9 mm	2–3 mm	up to 2 mm
Fruit pedicel length	8–16 mm	7.5–17 mm	1.5–5 mm
Stipe length	ca. 39 mm	ca. 15 mm	22–29 mm
Stipe shape	curved	straight	straight
Monocarp size	15–20 × 14–16 mm	20–33 × 16–22 mm	17–31 × 15–24 mm
Monocarp shape	globose to subglobose, axis straight	elliptic, axis curved	subglobose, axis straight
Monocarp surface	inconspicuously undulate or smooth	slightly rugulose	inconspicuously undulate or smooth
Diaphragm separating seeds	membranous	membranous	thick
Seeds per monocarp	2 to 6	4 to 16	2 to 11

tudinal ridges, drying brown, densely hairy, with short golden hairs, apex rounded, base rounded; pericarp thick, 1.2–1.8 mm; stipes ca. 39 mm long, ca. 2.2 mm thick; seeds 2 to 6 per monocarp, attached laterally in 2 rows, separated in monocarp by membranous diaphragms, ellipsoidal with 1 or 2 flattened faces, 10.5–12 × 7.5–9.5 × 4–6.5 mm, drying brown, smooth, shiny, arillate, raphe ridged, hilum V-shaped.

Distribution and habitat. *Uvaria curvistipitata* is endemic to Borneo (Kalimantan Timur and Sabah; Fig. 2). It has been collected from lowland forests (including disturbed areas), at elevations from 20 to 200 m.

IUCN Red List category. *Uvaria curvistipitata* is assessed as Vulnerable, VU B1ab(iii), according to IUCN Red List categories and criteria (IUCN, 2001). Despite the comparatively intense botanical collecting in Sabah, *U. curvistipitata* has not been collected in the region since 1984, although a later collection (dating from 1990) was made in Kalimantan Timur. None of the collection localities are within protected areas, and Bintang Mas (Sabah) and Kenangan (Kalimantan Timur) have been severely logged. East Kalimantan has been extensively exploited since 1960 for its natural resources, including timber, oil, gas, coal, and other minerals (Fatawi & Mori, 2000). Prolonged droughts (in 1982–1983 and 1997–1998) and forest fires (in 1998) caused severe damage to the Balikpapan area (van Nieuwstadt & Sheil, 2005). The extent of occurrence of this species is less than 20,000 km² and therefore the Vulnerable category is recommended.

Phenology. Three specimens are known with flowers collected between August and November; only one fruiting specimen is known, collected in April.

Discussion. Data on the inflorescence and flower structure in *Uvaria curvistipitata* are limited as the holotype and isotypes are the only collections available that have mature flowers. The species most closely resembles *U. javana* Dunal (Boerlage, 1899; Sinclair, 1955), which has previously been recorded from the Andaman Islands, Peninsular Malaysia, Sumatra, Java, and Borneo (Merrill, 1929; Sinclair, 1955). Fruiting material of *U. curvistipitata* has furthermore previously been confused with more densely hairy specimens of *U. excelsa* (Hook. f. & Thomson) King (Utteridge, 2000, as *Cyathostemma excelsum*). Differences between *U. curvistipitata*, *U. javana*, and *U. excelsa* are detailed in Table 1.

Paratypes. INDONESIA. **Kalimantan Timur [East Kalimantan]:** Balikpapan, Sepaku area, Kenangan, PT. ITCI, 10 Nov. 1990, *K. Sidiyasa 490* (L). MALAYSIA. **Sabah:** Sandakan Distr., Sungai Kun Kun, 2 Apr. 1984, *Sigin et al. SAN 56772* (K, KEP, L, SAN); Sandakan Distr., Keramuak, Bintang Mas logging area, 28 Aug. 1975, *T. Arsid SAN 81504* (K, L, SAN).

3. Uvaria clementis (Merr.) Attanayake, I. M. Turner & R. M. K. Saunders, comb. nov. Basionym:

Artabotrys clementis Merr., J. Straits Branch Roy. Asiat. Soc. 85: 174–175. 1922. TYPE: Borneo. Sabah: Sandakan & vic., Batu Lima & Sibuga, Sep.–Dec. 1920, *M. Ramos 1667* (lectotype, designated here, K; duplicate, A).

Uvaria parviflora Hook. f. & Thomson, Fl. Ind. 1: 103. 1855, non *Uvaria parviflora* A. Rich., Fl. Seneg. Tent. 1: 9, tab. 3, fig. 1. 1831, nec *Uvaria parviflora* (Michx.) Torr. & A. Gray, Fl. N. Amer. [Torr. & A. Gray] 1: 45. 1838. *Uva parviflora* Kuntze, Revis. Gen. Pl. 1: 8. 1891, replacement name for *Uvaria parviflora* Hook. f. & Thomson. *Cyathostemma hookeri* King, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 61(1): 10. 1892, nom. illeg. superfl. *Uvaria kingii* L. L. Zhou, Y. C. F. Su & R. M. K. Saunders, Syst. Biodivers. 7: 255. 2009, nom. illeg. superfl. TYPE: [Malaysia.] Peninsular Malaysia, Prince of Wales Island [Penang], s.d., *W. E. Phillips s.n.* (lectotype, designated here, K 000615957).

Discussion. This species was first described as *Uvaria parviflora* by Hooker and Thomson (1855). Unfortunately, this was a later homonym, the species name having already been used twice before (Richard in Guillemin & Perrottet, 1831; Torrey & Gray, 1838). King (1892) considered the species a member of the genus *Cyathostemma* and described it as *C. hookeri* King, citing *U. parviflora* Hook. f. & Thomson in synonymy and explicitly including its type in the new species. Given that *U. parviflora* was a later homonym, this would not have affected the legitimacy of *C. hookeri* King, if it were not for the fact that Kuntze (1891) had already transferred *U. parviflora* Hook. f. & Thomson to his new genus *Uva* (a superfluous substitute for *Uvaria* L.). The name *Uva parviflora* Kuntze must be considered an avowed substitute for *Uvaria parviflora* Hook. f. & Thomson (McNeill et al., 2006: Art. 58.1, Ex. 1), and King's name *C. hookeri* is superfluous and illegitimate because the name *C. parviflorum* was not pre-empted (McNeill et al., 2006: Art. 55.1, Ex. 1), and automatically typified by the type of *Uvaria parviflora* Hook. f. & Thomson. This in turn makes the name *Uvaria kingii* L. L. Zhou, Y. C. F. Su & R. M. K. Saunders (proposed as a substitute for *C. hookeri*, as the name *Uvaria hookeri* was not available) superfluous and illegitimate also.

Zhou et al. (2009) overlooked the presence of a synonym that could provide a combination in *Uvaria*, however. Merrill (1922) described *Artabotrys clementis* Merr. from Sabah in Borneo. It seems very likely that Merrill actually intended to publish *Uvaria clementis*: the type specimen was distributed under this name, and in the description the new species is compared with *U. lurida* Hook. f. & Thomson. The name clearly appears under *Artabotrys* rather than *Uvaria* in the publication, however, and since Merrill did not publish a correction, its transfer to *Uvaria* is required. The holotype was deposited in PNH but was destroyed during World War II; we have accordingly selected a lectotype from K.

There are two sheets in the Kew herbarium that represent original material of *Uvaria parviflora* Hook. f. & Thomson. The only collection information they possess is the annotation as Prince of Wales Island. The two sheets are not labeled as being part of the same specimen and therefore must be considered as separate specimens (McNeill et al., 2006: Art. 8.3). One of the two is therefore designated lectotype here.

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Literature Cited

Barraclough, S. L. & K. B. Ghimire. 2000. Agricultural Expansion and Tropical Deforestation: Poverty, International Trade and Land Use. Earthscan, London.

Boerlage, J. G. 1899. Notes sur les Anonacées du jardin botanique de Buitenzorg. Icon. Bogor. 1: 79–156, pl. 26–50.

Fatawi, M. & T. Mori. 2000. Description of forests and forestry in East Kalimantan. Pp. 1–11 *in* E. Guhardja, M. Fatawi, M. Sutisna, T. Mori & S. Ohta (editors), Rainforest Ecosystems of East Kalimantan. Ecological Studies 140. Springer-Verlag, Tokyo.

Guillemin, A. & G. S. Perrottet. 1831. *Uvaria parviflora* A. Rich. P. 9 *in* Florae Senegambiae Tentamen, Vol. 1. Treuttel & Wurtz, Paris.

Hooker, J. D. & T. Thomson. 1855. *Uvaria parviflora* Hook. f. & Thomson. P. 103 *in* Flora Indica, Vol. 1. W. Pamplin, London.

IUCN. 2001. IUCN Red List Categories and Criteria, Version 3.1. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland, and Cambridge, United Kingdom.

Keßler, P. J. A. 1993. Annonaceae. Pp. 93–129 *in* K. Kubitzki, J. G. Rohwer & V. Bittrich (editors), The Families and Genera of Vascular Plants, Vol. 2. Springer-Verlag, Berlin.

King, G. 1892. Materials for a Flora of the Malay Peninsula. No. 4. J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 61: 1–130.

King, G. 1893. The Annonaceae of British India. Ann. Roy. Bot. Gard. (Calcutta) 4: 1–169, pl. 1–220.

Kuntze, C. E. O. 1891. *Uva parviflora* Kuntze. P. 8 *in* Revisio Generum Plantarum, Vol. 1. A. Felix, Leipzig.

McNeill, J., F. R. Barrie, H. M. Burdet, V. Demoulin, D. L. Hawksworth, K. Marhold, D. H. Nicolson, J. Prado, P. C. Silva, J. E. Skog, J. H. Wiersema & N. J. Turland (editors). 2006. International Code of Botanical Nomenclature (Vienna Code). Regnum Veg. 146.

Meade, C. V. 2000. A Systematic Revision of the *Uvaria* L. Group (Annonaceae) in Continental Asia. Ph.D. Thesis, Trinity College, University of Dublin, Dublin.

Meade, C. V. 2005. A new species of *Uvaria* (Annonaceae) from Southeast Asia. Adansonia, sér. 3, 27: 17–20.

Merrill, E. D. 1922. New or noteworthy Bornean plants. Part I. J. Straits Branch Roy. Asiat. Soc. 85: 151–201.

Merrill, E. D. 1929. Plantae Elmerianae Borneenses. Univ. Calif. Publ. Bot. 15: 1–316.

Scheffer, R. H. C. C. 1885. Sur quelques plantes nouvelles ou peu connues de l'Archipel Indien (Annonaceae). Ann. Jard. Bot. Buitenzorg 2: 1–31.

Sinclair, J. 1955. A revision of the Malayan Annonaceae. Gard. Bull., Singapore 14: 149–516.

Torrey, J. & A. Gray. 1838. *Uvaria parviflora* Torr. & A. Gray. P. 45 *in* A Flora of North America, Vol. 1. Wiley & Putnam, New York.

Utteridge, T. M. A. 2000. Revision of the genus *Cyathostemma* (Annonaceae). Blumea 45: 377–396.

van Nieuwstadt, M. G. L. & D. Sheil. 2005. Drought, fire and tree survival in a Borneo rain forest, East Kalimantan, Indonesia. J. Ecol. 93: 191–201.

van Steenis-Kruseman, M. J. 1950. Malaysian plant collectors and collections. Fl. Malesiana, ser. 1, 1: 1–606.

Zhou, L., Y. C. F. Su & R. M. K. Saunders. 2009. Molecular phylogenetic support for a broader delimitation of *Uvaria* (Annonaceae), inclusive of *Anomianthus*, *Cyathostemma*, *Ellipeia*, *Ellipeiopsis* and *Rauwenhoffia*. Syst. Biodivers. 7: 249–258.

Zhou, L., Y. C. F. Su, P. Chalermglin & R. M. K. Saunders. 2010. Molecular phylogenetics of *Uvaria* (Annonaceae): Relationships with *Balonga*, *Dasoclema* and Australian species of *Melodorum*. Bot. J. Linn. Soc. 163: 33–43.